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A description of copulation in the Kori Bustard *Ardeotis kori struthiunculus*

by Sara Hallager

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Bustards are an Old World family with 25 species in 6 genera (Johnsgard 1991). Medium to large ground-dwelling birds, they inhabit the open plains and semi-desert regions of Africa, Australia and Eurasia. The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Animals lists four species of bustard as Endangered, one as Vulnerable and an additional six as Near-Threatened, although some species have scarcely been studied and so their true conservation status is unknown. Agricultural changes, overgrazing, hunting, trapping, habitat loss, droughts and wars are the foremost threats facing all bustard species.

The Kori Bustard *Ardeotis kori* is a large polytypic bustard with two subspecies classified according to geographical distribution, size and plumage variations. One population, *A. k. struthiunculus*, resides in eastern Africa; the nominate race *A. k. kori* occurs in southern Africa (Johnsgard 1991). Kori Bustards are polygynous (Johnsgard 1991) and males gather singly or in loose lek-like formations to display to females during the breeding season. With neck inflated and wings drooping, a male struts around snapping his bill and producing a booming sound. If he is successful in attracting a female to his territory, copulation ensues, after which the male returns to his display grounds to attract another female. He plays no part in incubation nor in rearing the chicks.

The breeding biology of most bustards is poorly known and the events leading up to and including copulation are known for only a handful of species. The circumstances surrounding copulation have been described fully for wild populations

of Great Bustard *Otis tarda* (Cramp & Simmons 1980, Blotzheim 1973), Little Bustard *Tetrax tetrax* (Moseykin 1992, Frish 1976), Great Indian Bustard *Ardeotis nigriceps* (Ali & Rahmani 1984), Houbara Bustard *Chlamydotis undulata* (Urban *et al.* 1986), and captive Australian Bustard *Ardeotis australis* (Fitzherbert 1978). Partial descriptions exist for wild Lesser Florican *Eupodotis indica* (Dharmakumarsinhji 1950), Black-bellied Korhaan *Eupodotis melanogaster* (Kemp & Tarboton 1976) and Bengal Florican *Eupodotis bengalensis* (Rahmani *et al.* 1988). Despite the fact that Kori Bustards are large and conspicuous birds, the events surrounding copulation have not been previously described.

A breeding flock of Kori Bustards *Ardeotis kori struthiunculus* has been maintained at the Smithsonian National Zoological Park (SNZP) in Washington DC since 1997. This paper describes, for the first time, the events surrounding copulation in this polygynous species. Comparisons with the copulatory behaviour of other polygynous bustards are also provided.

Description of mating in the Kori Bustard

Copulation was observed on three occasions at the SNZP. The event was always observed from the public viewing area of the exhibit. Because the birds were accustomed to people in this area, the author's presence did not appear to interfere with the behaviour of the birds. In all instances, the same female was involved, although a different male was present each time. Copulation always occurred when the male was at peak display (i.e. neck inflated, wings drooping and booming). The events leading up to, including and following copulation can be divided into four sequences. The description that follows is typical of each observed copulation event.

Initiation of copulation

During the SNZP breeding season, May - October, the male displayed nearly continuously in the presence or absence of females. The level of display varied from low (inflated neck and cocked tail) to high (inflated neck, drooped wings and booming). His display intensified when a female was in view. Increased levels of display were often accompanied by relentless pursuing of the female. A female Kori Bustard near to a displaying male appeared quite uninterested in the male, outwardly appearing to ignore and even avoid him. The events leading to copulation were initiated by a receptive female who began the sequence by lying down near the displaying male.

Pre-copulation

Once the female was seated, the male approached her from behind. He approached her either in full display with his neck inflated and wings drooping or in partial display with his neck inflated and his tail feathers raised. He stood over the female and began to peck at the back and sides of her head in a slow and deliberate way, his tail and crest feathers raised slightly. At each peck, the female recoiled slightly. The male stood for 5 - 10 min alternately pecking at the female's head and stepping from

side to side behind her before he sat down on his hocks and continued pecking at the back of her head for another 5 min. The female remained seated throughout the entire bout of head pecking.

Copulation

After 10 - 15 min of head pecking, the seated male moved closer towards the sitting female using his hocks to progress forward. As he approached the female's cloacal area, he spread his wings and mounted her from behind. Presumably, the female lifted her cloaca so that she could make cloacal contact with the male, but this was not observed. Actual copulation lasted no more than a few seconds.

Post-copulation

Immediately following copulation, both birds rose and parted quickly, violently shaking their feathers. On two occasions, the female made a 'barking' sound as she moved away from the male. Following copulation, both birds resumed other activities, with the male often resuming display.

Comparisons with other polygynous bustard species

In the few polygynous bustard species for which full or partial descriptions of copulation exist, the events leading up to, including and following copulation are similar to those observed in the Kori Bustard.

Initiation of copulation

The type of display in bustards varies from species to species, but the purpose of display in all male bustards is the same - to attract females. Once a male has managed to attract a female, observers of Great Indian Bustard (Ali & Rahmani 1984), Little Bustard (Moseykin 1992), Bengal Florican (Narayan 1990) and Great Bustard (Blotzheim 1973) document that the female of each species appears uninterested in the displaying male, often deliberately avoiding his advances. Pursuit of females may serve to stimulate and prepare the females for copulation (Johnsgard 1991). Female Great Bustards have been observed initiating copulation by pecking at the cloacal area of the male (Johnsgard 1991), but this has not been reported in any other bustard species. For the species in which copulation has been described, a receptive female takes the initiative for copulation by assuming a sitting position.

Pre-copulation

All existing descriptions of pre-copulatory behavior in bustards involve the male standing over the female and pecking at the back of her head. The duration of this head pecking appears to vary between species and even within species. For example, in the Great Indian Bustard (Ali & Rhamani 1984), pecking behavior lasted up to 16 min. In contrast, the same behaviour in the Australian Bustard varied from 22-33 minutes (Fitzherbert 1978) while in the Great Bustard head pecking occurred for only few minutes (Cramp & Simmons 1984). Head pecking has been reported for

the Lesser Florican (Dharmakumarsinhji 1950), Bengal Florican (Rahmani *et al.* 1988) and Houbara Bustard (Launay 1990) but the duration has not been reported for any of these species.

Copulation

In all species where copulation has been observed, the event occurs very rapidly. Observations of copulation in Great Indian Bustard (Ali & Rahmani 1984), Great Bustard (Blotzheim 1973), Australian Bustard (Fitzherbert 1978), Houbara Bustard (Launay 1990) and Little Bustard (Schulz 1986) report the event lasting only a few seconds.

Post-copulation

Post-copulatory behaviour observed in Great Bustard (Blotzheim 1973), Australian Bustard (Fitzherbert 1978), Great Indian Bustard (Ali and Rahmani 1984), Houbara Bustard (Launay 1990), Bengal Florican (Narayan 1990) and Little Bustard (Moseykin 1992) reveal that males and females separate rapidly and resume other activities. Males frequently resume displaying to attract other females (Johnsgard 1991).

Polygyny versus monogamy in bustards

Among the 25 species of bustard, present evidence indicates the majority are polygynous. There is a wide range of size and plumage dimorphism between the sexes and males advertise themselves on dispersed display grounds (leks) using extravagant displays (Johnsgard 1991). Lekking mating systems occur typically when males are removed from parental care and the environment provides little potential for resource or mate control (Emlen & Oring 1977). In polygynous bustards which have males who lek in most species, these conditions are met: precocial young free the male from parental care, an omnivorous food supply is scattered and widely available, ground nesting ensures plenty of available nesting sites, and low densities of females suggest that males are not able to defend females economically (Dale 1992). Thus, as Emlen & Oring (1977) state, the ecology of bustards has a high "environmental potential for polygamy".

Not all species of bustards are polygynous. In the genus *Eupodotis*, there are at least three and perhaps five monogamous species. The Black-Throated Bustard *Eupodotis vigorsii*, Blue Bustard *Eupodotis caerulescens* and White-Bellied Bustard *Eupodotis senegalensis* are monogamous (Goriup pers. comm.) and it is speculated that monogamy occurs in Ruppell's Bustard *Eupodotis rueppellii* and Little Brown Bustard *Eupodotis humilis* (Johnsgard 1991), although data on these species are lacking and anecdotal. What little is known of the mating strategies of any of these species contrasts with that of polygynous bustards in that these species form monogamous pair bonds throughout the year, often calling together to maintain the pair bond (Johnsgard 1991). In contrast to polygynous bustards, there are no known male self-advertisement displays and both sexes are monomorphic in size and plumage.

Because of a scarcity of data on these small African bustards, it is difficult to speculate why any of them might be monogamous. Perhaps the tendency to occur in more open and arid habitats than other bustards may play a role. Dale (1992) speculated that the harsh environmental conditions that these species typically occur in could limit "male emancipation from parental care" although to what extent the males of these species contribute to the raising of chicks is unknown. If resources are limited where these species live, then the importance of the male in defending territories might be a reason for monogamy (Dale 1992). Meaningful conclusions about the importance of monogamy in any bustard species cannot be made until more is known about the general biology and ecology of the birds.

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